



## Catastrophic invaders: the impact and control of social wasps

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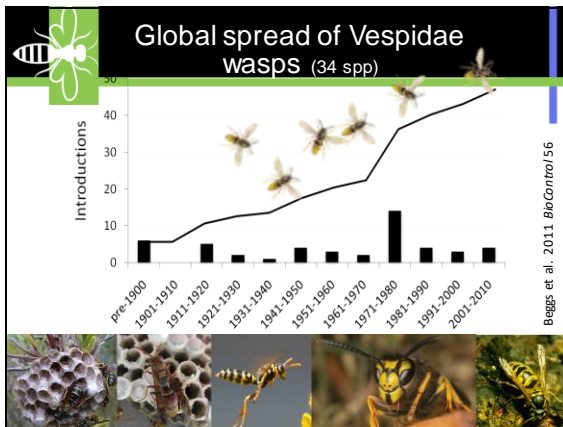






## Acknowledgements

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## Two “super invaders”

*Vespula germanica*

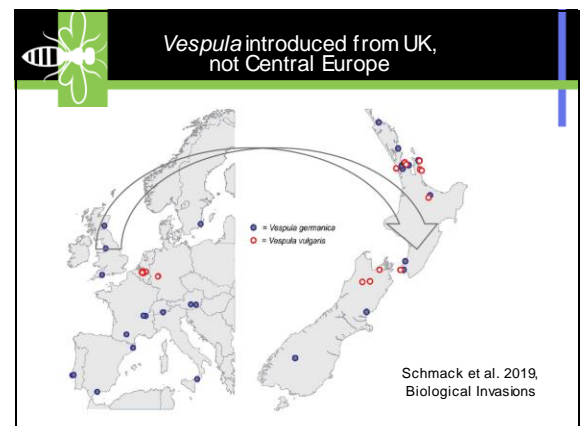
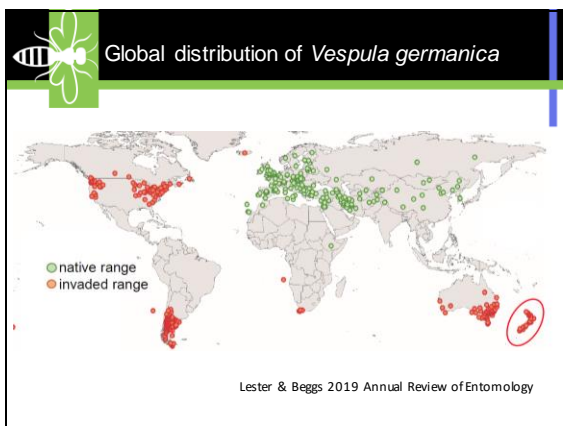
- 9 countries
- Invasive in 3

*Vespula vulgaris*

- 6 countries
- Invasive in 1



Beggs et al. 2011 *BioControl* 56



Invasive Vespidae in New Zealand			
		Arrival	Distribution
<i>Polistes chinensis</i>	Asian paper wasp	1979	Nationwide
<i>Polistes humilis</i>	Australian paper wasp	Late 1800's	Northern North Island
<i>Polistes dominula</i>	European paper wasp	2016	Auckland, Nelson, Blenheim
<i>Vespula germanica</i>	German wasp	1945	Nationwide
<i>Vespula vulgaris</i>	Common wasp	1970's	Nationwide



### Impacts – *Vespula* wasps

- Economic, ecological and social damage

### Economic Impacts

- Vespula* costs NZ economy at least \$130 million pa
  - 80% of impact = bees + flow-on effects to pastoral farming (pollination of clover)

MacIntyre, P.; Hellstrom, J. 2015: An evaluation of the costs of pest wasps (*Vespula* species) in New Zealand. DoC & MPI Report 44 p

### Ecological impacts

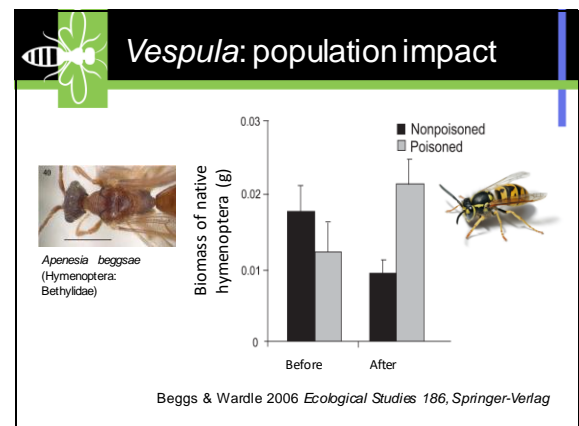
- Reduce abundance of honey dew by >90% for 3-4 months of year

Moller et al. 1991 / NZ J Zoo 18

### Ecological impacts

High predation rate on free-living caterpillars and orb web spiders


Toft & Rees 1998 *Ecol Ent* 23  
Beggs & Rees 1999 *Oecologia* 119



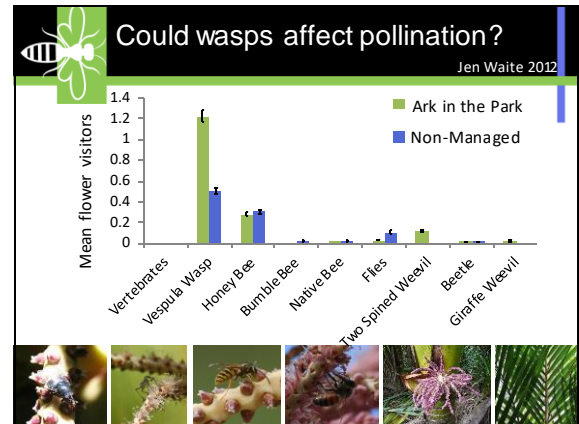
## Impact on soil food web

### 4-year field experiment


- Vespula* disrupt addition of honeydew to forest floor
  - increases litter decomposition
  - increases C sequestration by c. 40% = large, widespread effect on ecosystem C dynamics



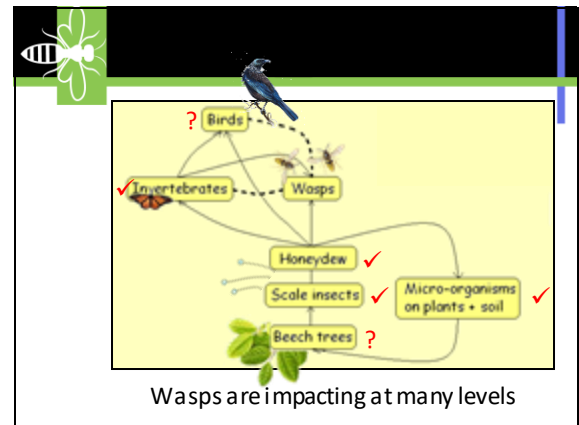
Wardle et al. 2010 *Biol Invasions* 12



## Potential impact on birds?



1974-2007 Decline in bird populations  
Elliott et al. 2010 *Biological Conservation*




## What drives abundance & distribution of social wasps on islands?

- 36 NZ offshore islands (406 plots) in 2018 & 2019
- 5 minute wasp counts
  - canopy cover
  - island size
  - island isolation
  - human settlement
  - number of boat docks/island
  - presence of introduced rodents
- GLMM; model selection & model averaging



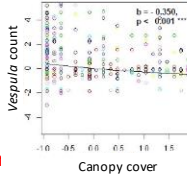
## What drives abundance & distribution of social wasps on islands?


- Invasive wasps widespread on islands (n=36)
  - 24 islands *Vespula* spp.
  - 33 islands *Polistes* spp.
- And abundant
  - Mean no. *Vespula* =  $2.12 \pm 0.32$  /plot/5 mins
  - Mean no. *Polistes* =  $5.56 \pm 0.57$  /plot/ 5 mins



## What drives abundance & distribution of social wasps on islands?

- Vespula* abundance
  - negatively correlated with canopy cover and island isolation, and positively correlated with human settlement
- Polistes* abundance
  - negatively correlated with canopy cover



 No relation to island size or presence of introduced rodents

## Wasp Control: Poison baiting

*Vespula* spp.

- Protein bait + fipronil
- Bait spacing @ 200 x 50 m
- >90% of colonies killed
- NZ, Argentina, Hawaii, Australia

*Polistes* spp.

- Don't scavenge



## VespeX wasp bait

- 2016 Finally, a fipronil wasp bait available commercially in NZ!

**IMPORTANT NOTICE**  
VespeX® is only available for sale to persons residing in New Zealand and who are registered with Merchanto Ltd as approved users.

<https://www.merchanto.com/vespex.html>



## Biological control

**Parasitoids:**  
*Sphecochaga vesparum vesparum*



- Imported from Europe
- Established
- 2/42 nests lightly infested at Pelorus Bridge in 2018
- No significant control**

Beggs et al. 2008 *Biological Control*

*S. v. burra*

- Imported from USA
- Released 1996-98
- Not established**

Beggs et al. 2002 *NZ J Zoo* 29





## Biological Control

Landcare Research (Bob Brown)

Imported into containment:

- Sphecochaga vesparum*
- Volucella zonaria* drone fly
- Volucella inanis* drone fly
- Metoecus paradoxus* beetles




<https://www.landcareresearch.co.nz/science/plants-animals-fungi/animals/invertebrates/invasive-invertebrates/wasps/wasp-biocontrol-updates/wasp-biocontrol-update-13>

## *Vespula* – Novel wasp control technologies

National Science Challenge

- RNAi
- Trojan mites + pathogens
- Trojan Female Technique
- Pheromones and semiochemicals





## Conclusions



1. *Vespula* wasps are ecologically damaging
2. *Polistes* are particularly widespread on NZ offshore islands, but we don't know their impact
3. Loss of intact forest cover is key driver of invasive wasps on offshore islands = plant native trees
4. Vespex works well, but we need more control tools